US006088759A

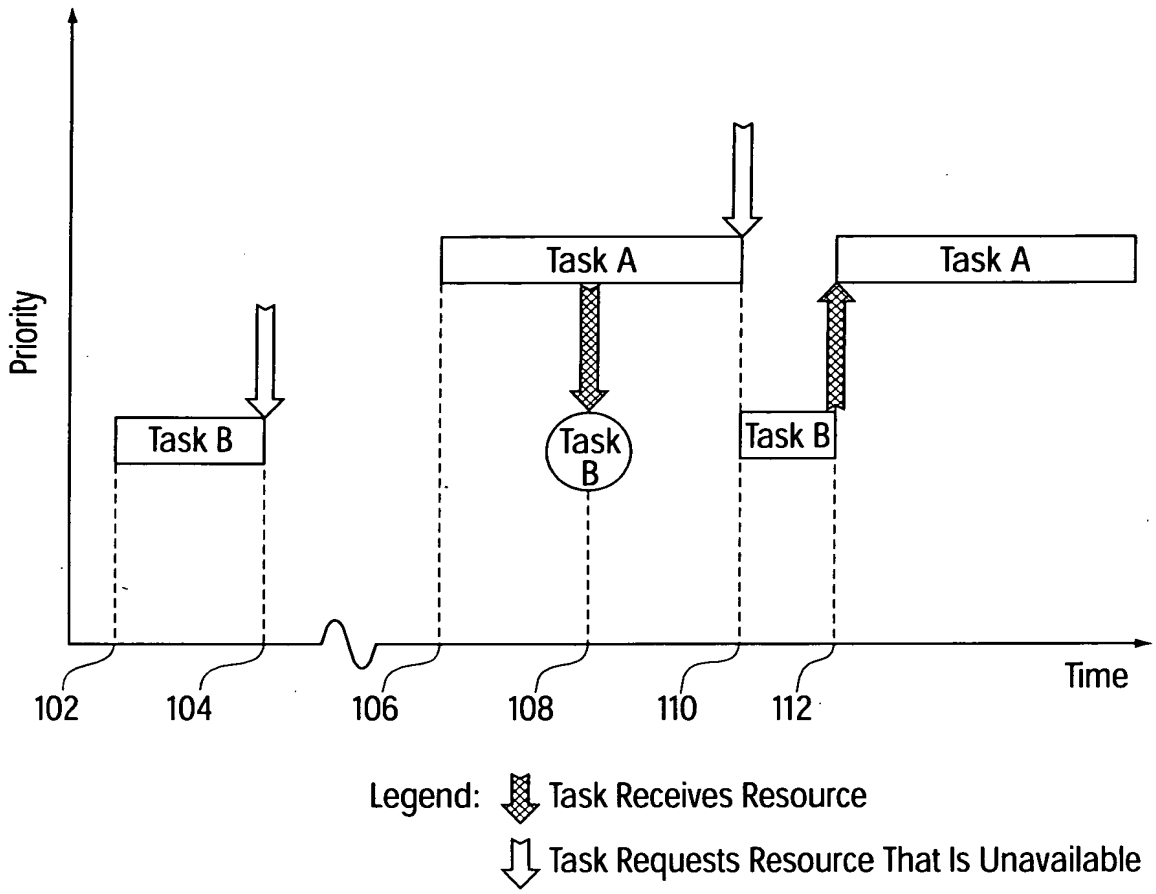

FIG. 1

EP 0 809 180 A2

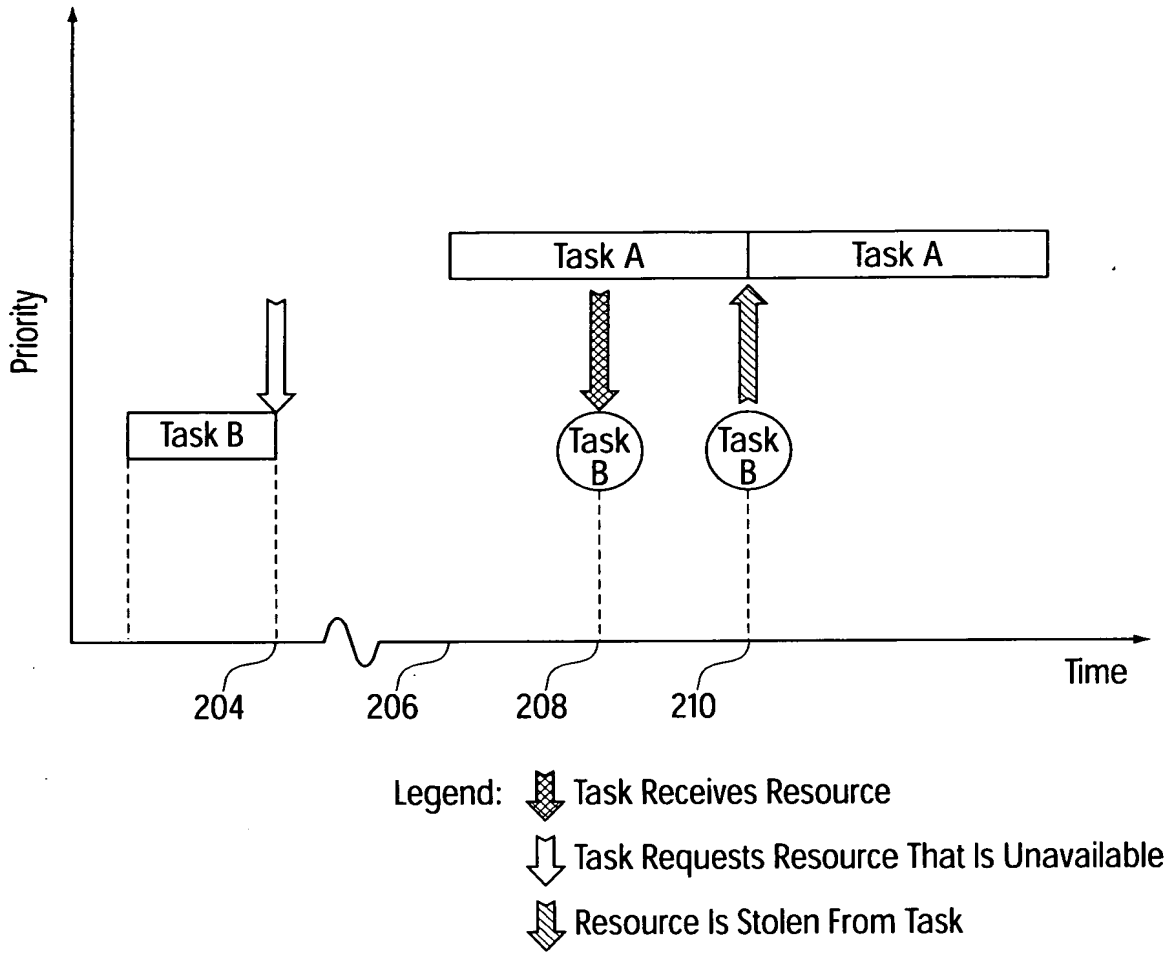

FIG. 2

Patent 5,968,157

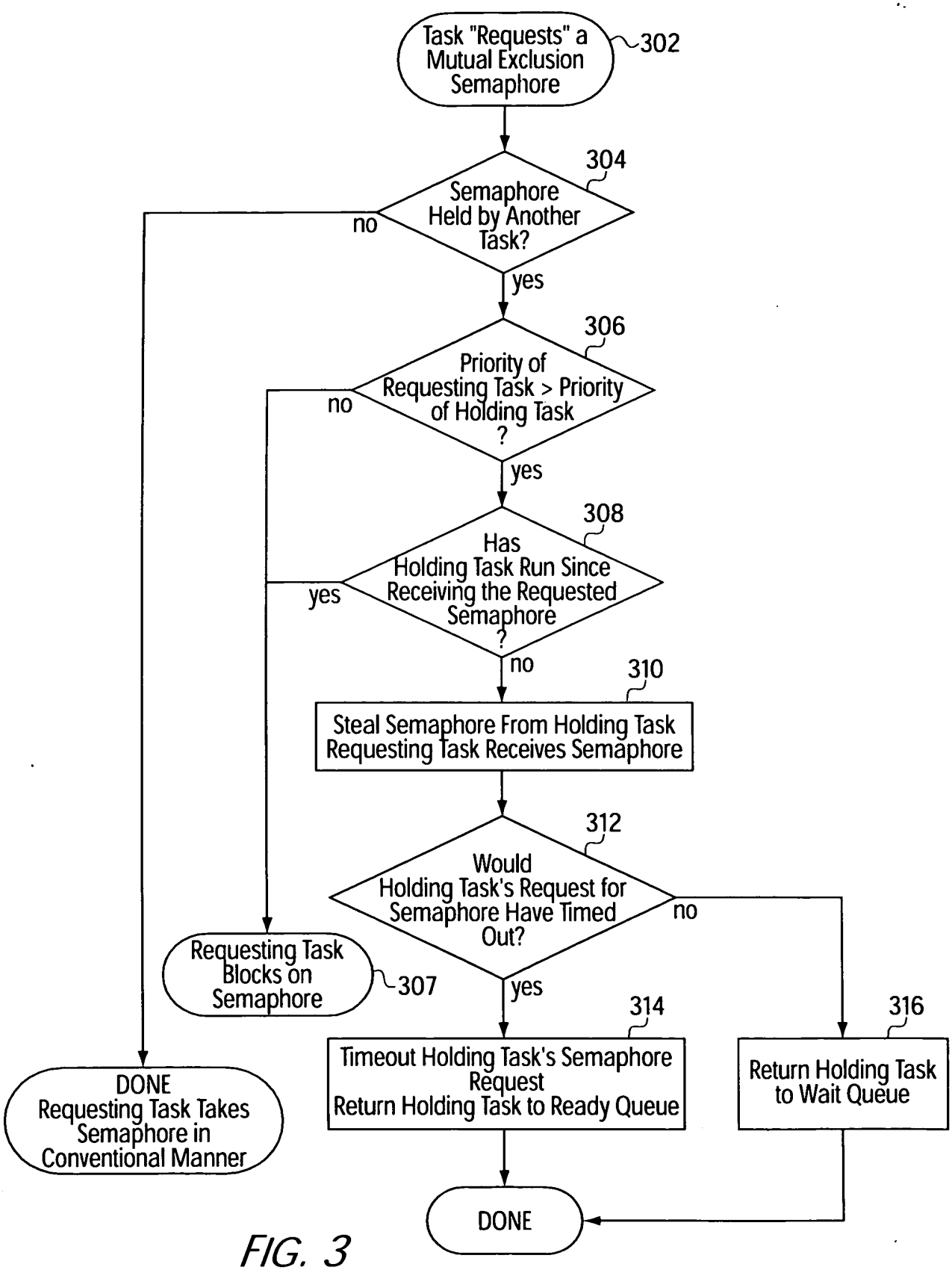

FIG. 3

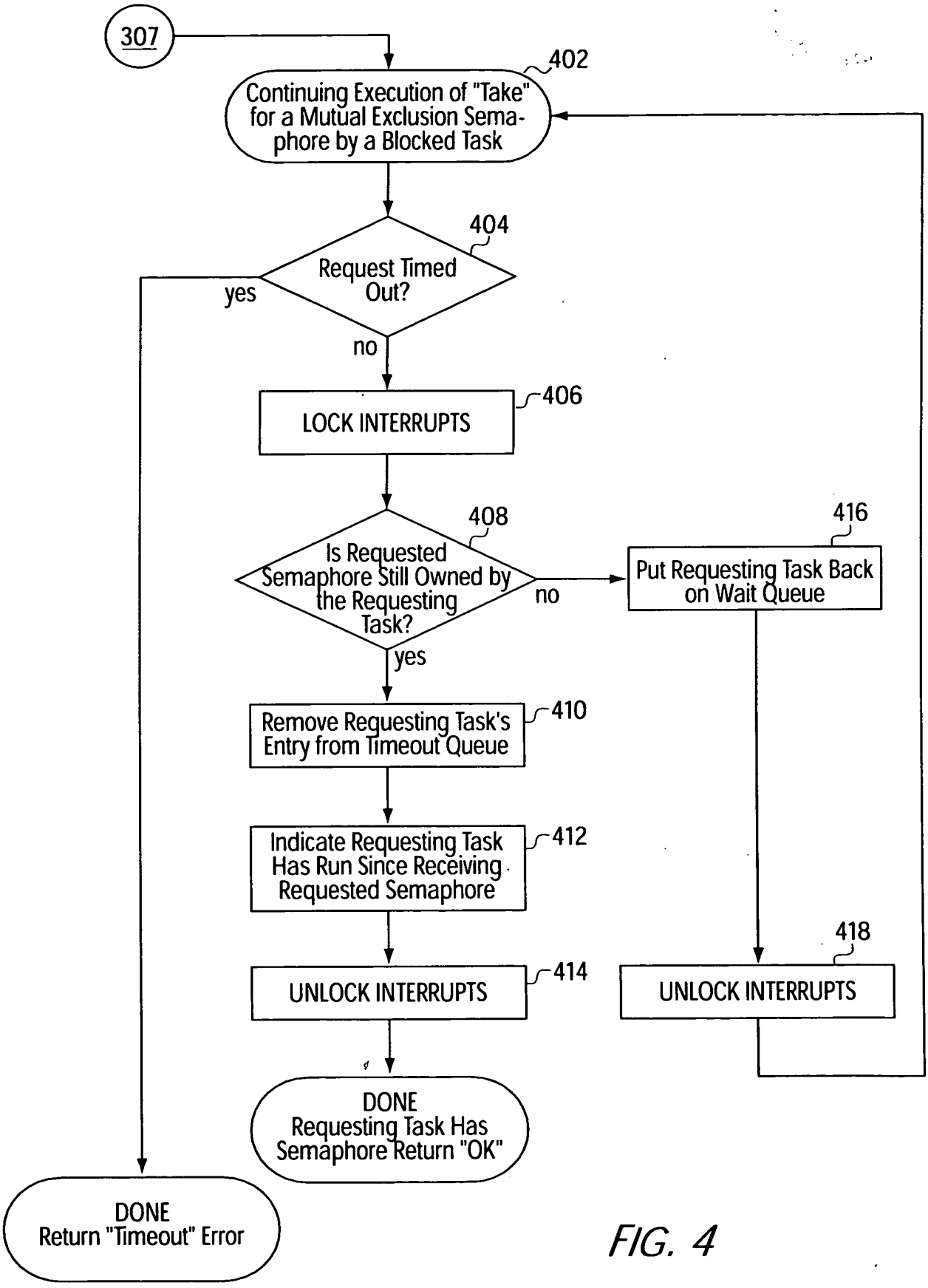
307
402
Continuing Execution of "Take" for a Mutual Exclusion Semaphore by a Blocked Task
404
Request Timed Out?
yes
no
406
LOCK INTERRUPTS
408
Is Requested Semaphore Still Owned by the Requesting Task?
no
416
Put Requesting Task Back on Wait Queue
yes
410
Remove Requesting Task's Entry from Timeout Queue
412
Indicate Requesting Task Has Run Since Receiving Requested Semaphore
418
414
UNLOCK INTERRUPTS
UNLOCK INTERRUPTS
DONE
Requesting Task Has Semaphore Return "OK"
DONE
Return "Timeout" Error

FIG. 4

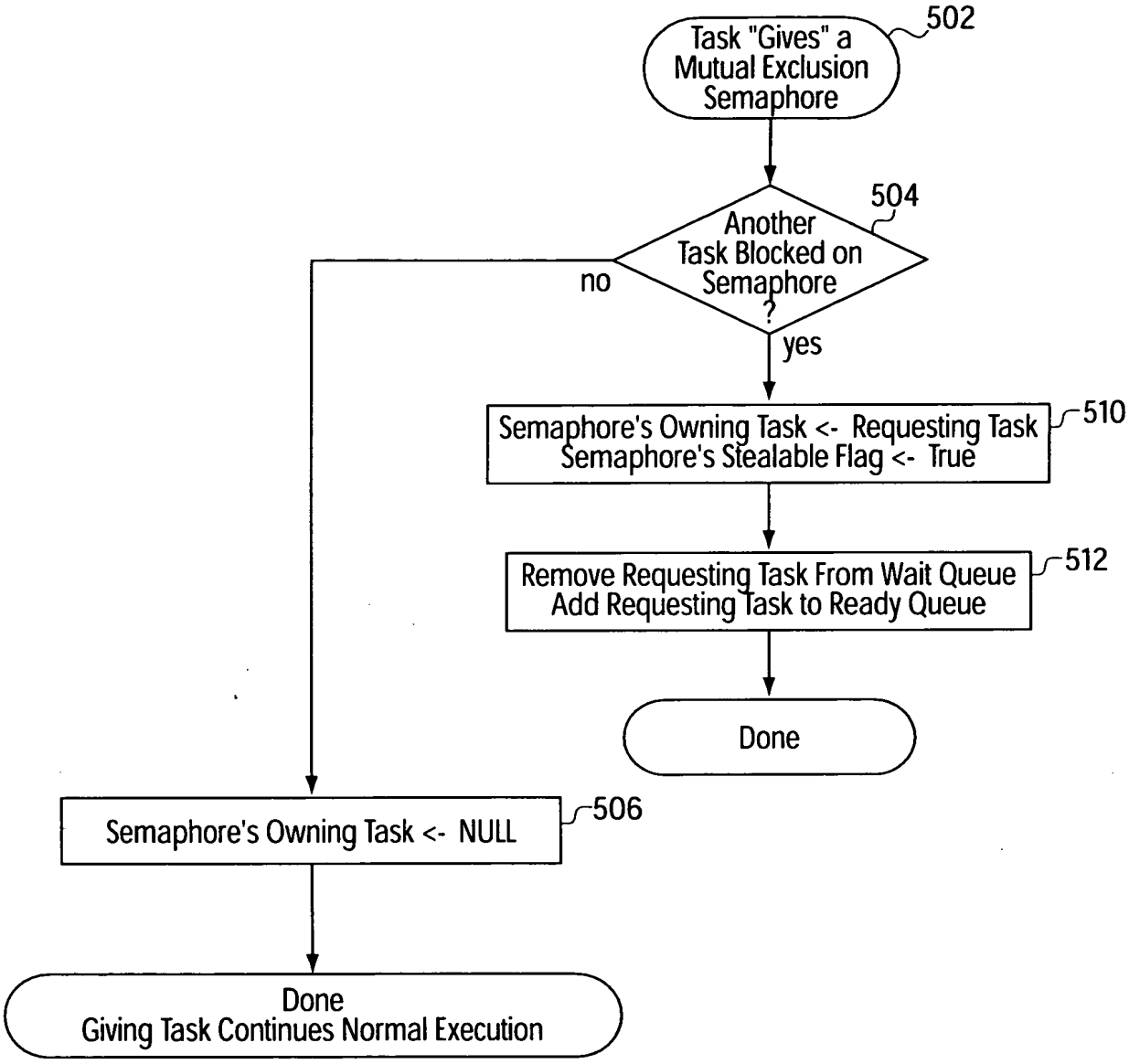
Task "Gives" a Mutual Exclusion Semaphore
502
Another Task Blocked on Semaphore ?
504
no
yes
Semaphore's Owning Task <- Requesting Task
Semaphore's Stealable Flag <- True
510
Remove Requesting Task From Wait Queue
Add Requesting Task to Ready Queue
512
Done
Semaphore's Owning Task <- NULL
506
Done
Giving Task Continues Normal Execution

FIG. 5

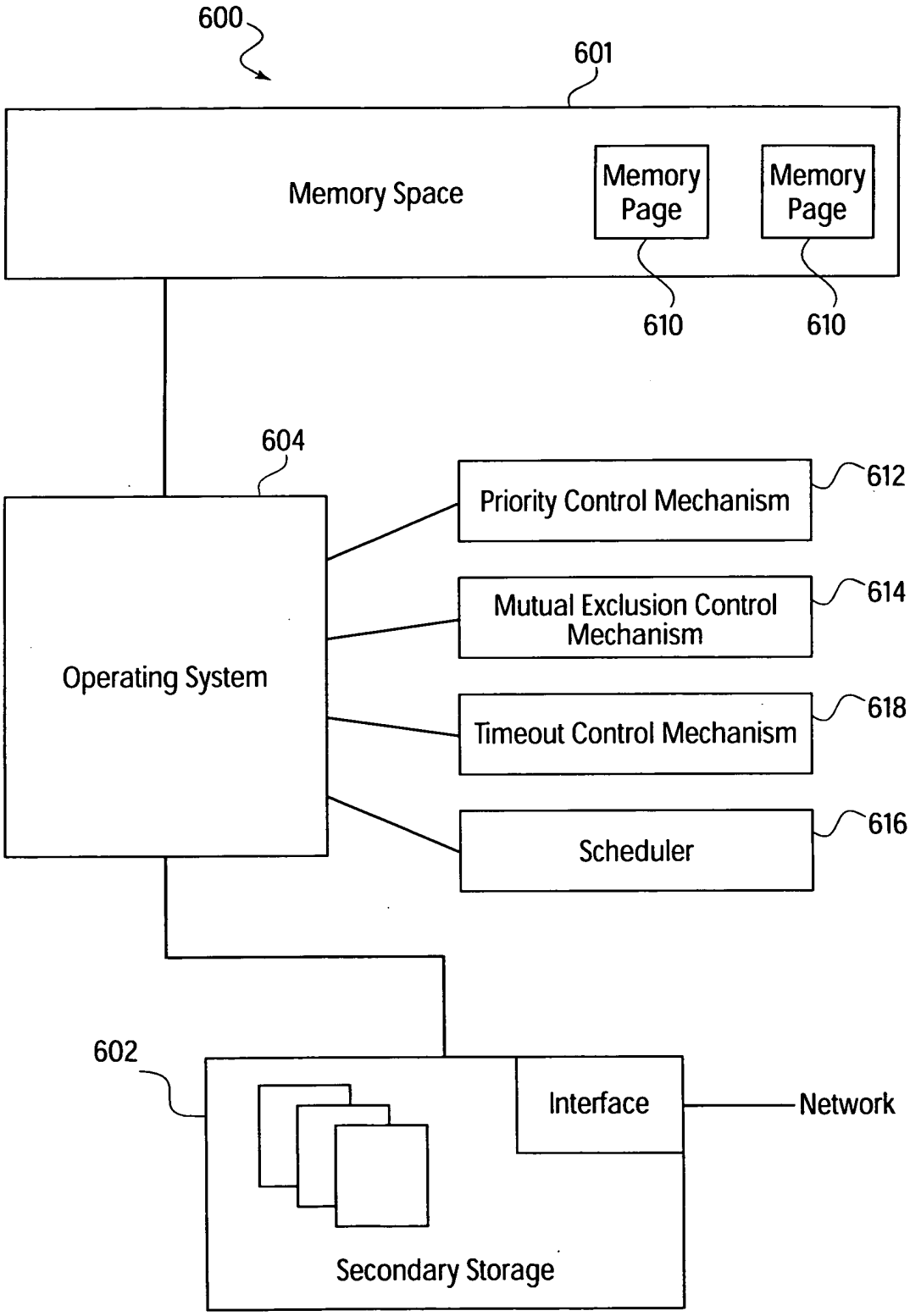
600
601
Memory Space
Memory Page
Memory Page
610
610
604
Operating System
Priority Control Mechanism
612
Mutual Exclusion Control Mechanism
614
Timeout Control Mechanism
618
Scheduler
616
602
Interface
Network
Secondary Storage

FIG. 6

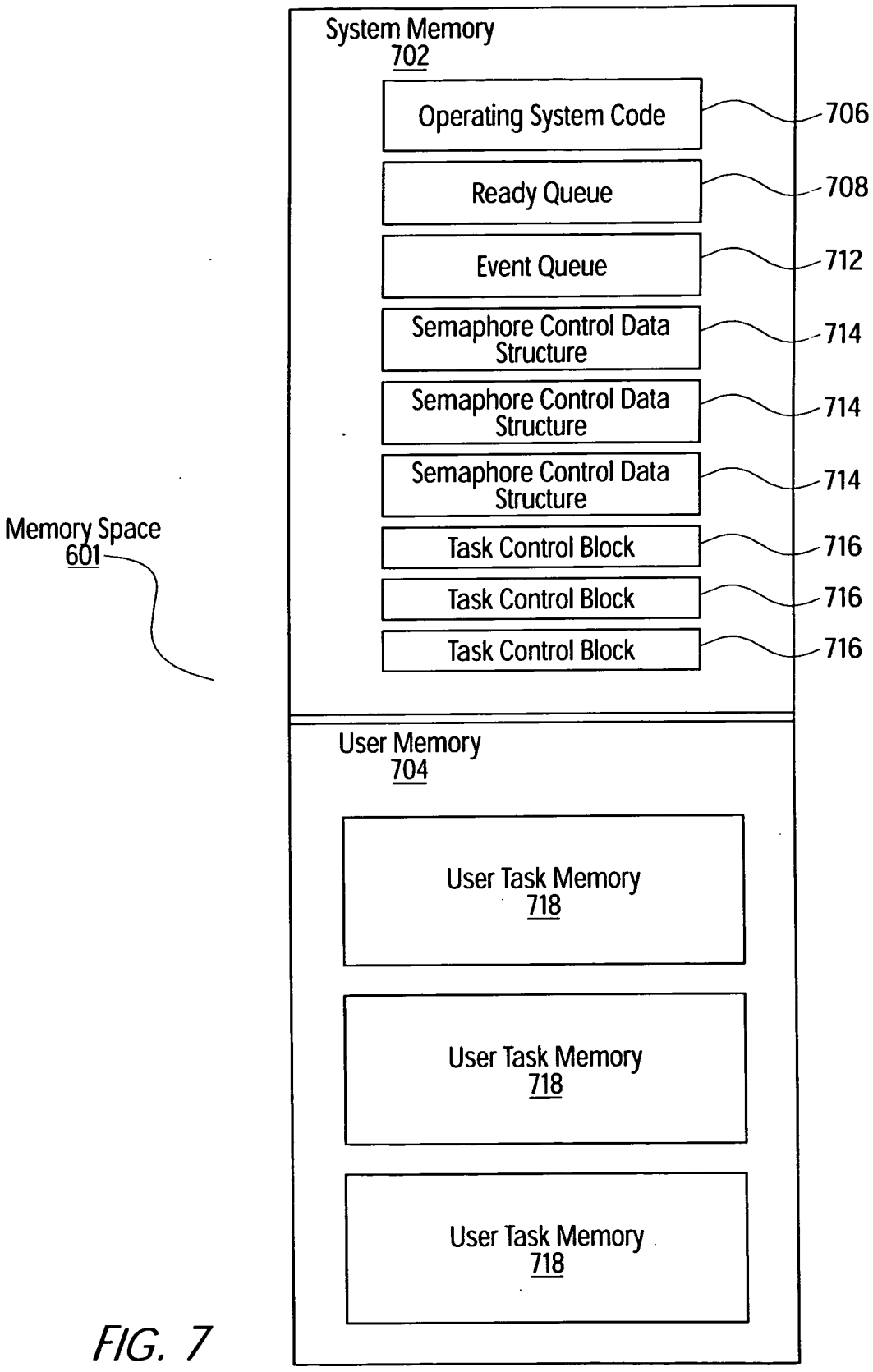
Memory Space
601
System Memory
702
Operating System Code
706
Ready Queue
708
Event Queue
712
Semaphore Control Data Structure
714
Semaphore Control Data Structure
714
Semaphore Control Data Structure
714
Task Control Block
716
Task Control Block
716
Task Control Block
716
User Memory
704
User Task Memory
718
User Task Memory
718
User Task Memory
718

FIG. 7

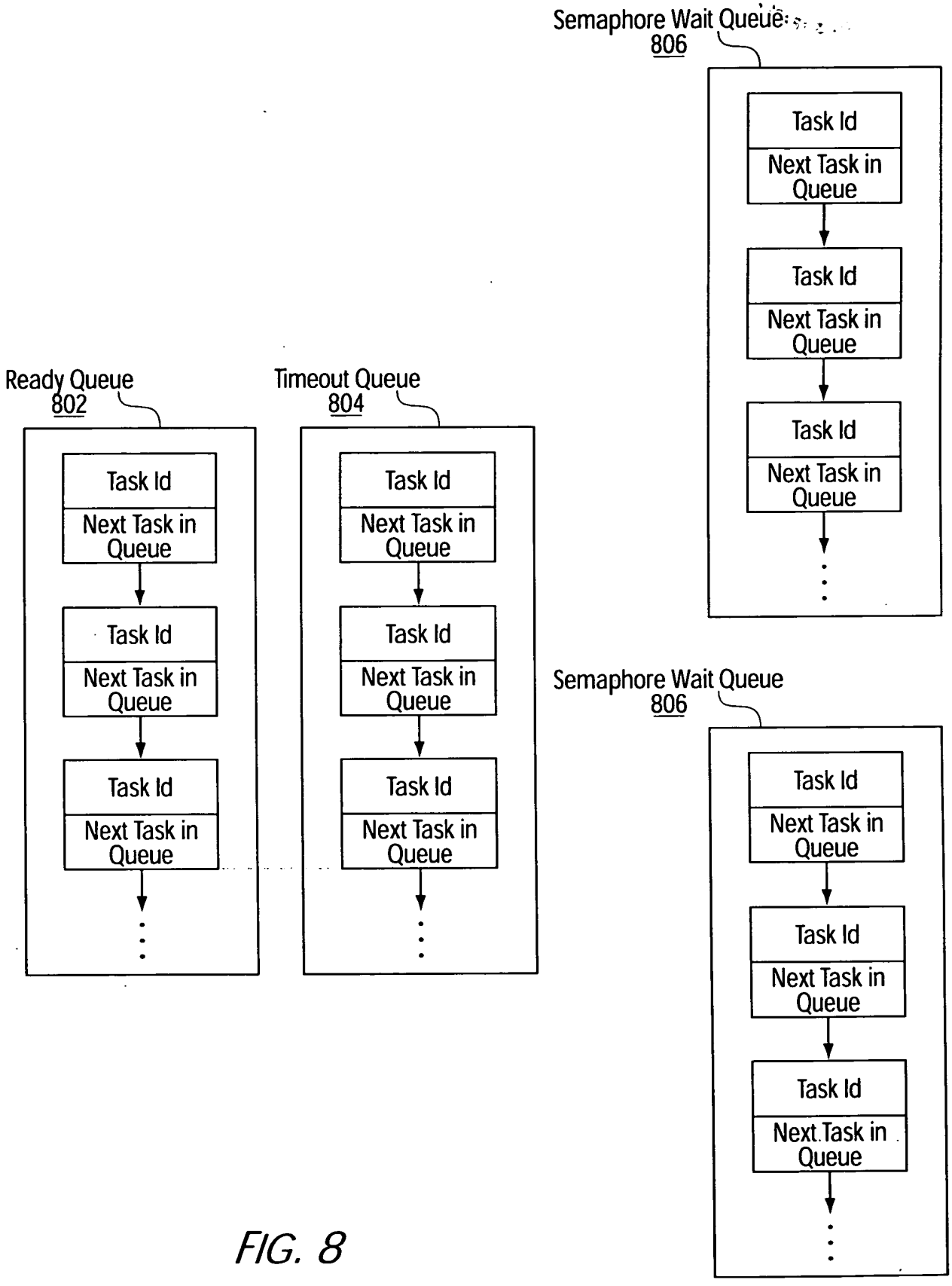
Semaphore Wait Queue
806
Task Id
Next Task in Queue
Task Id
Next Task in Queue
Task Id
Next Task in Queue
Ready Queue
802
Timeout Queue
804
Task Id
Next Task in Queue
Task Id
Next Task in Queue
Task Id
Next Task in Queue
Semaphore Wait Queue
806
Task Id
Next Task in Queue
Task Id
Next Task in Queue
Task Id
Next Task in Queue

FIG. 8

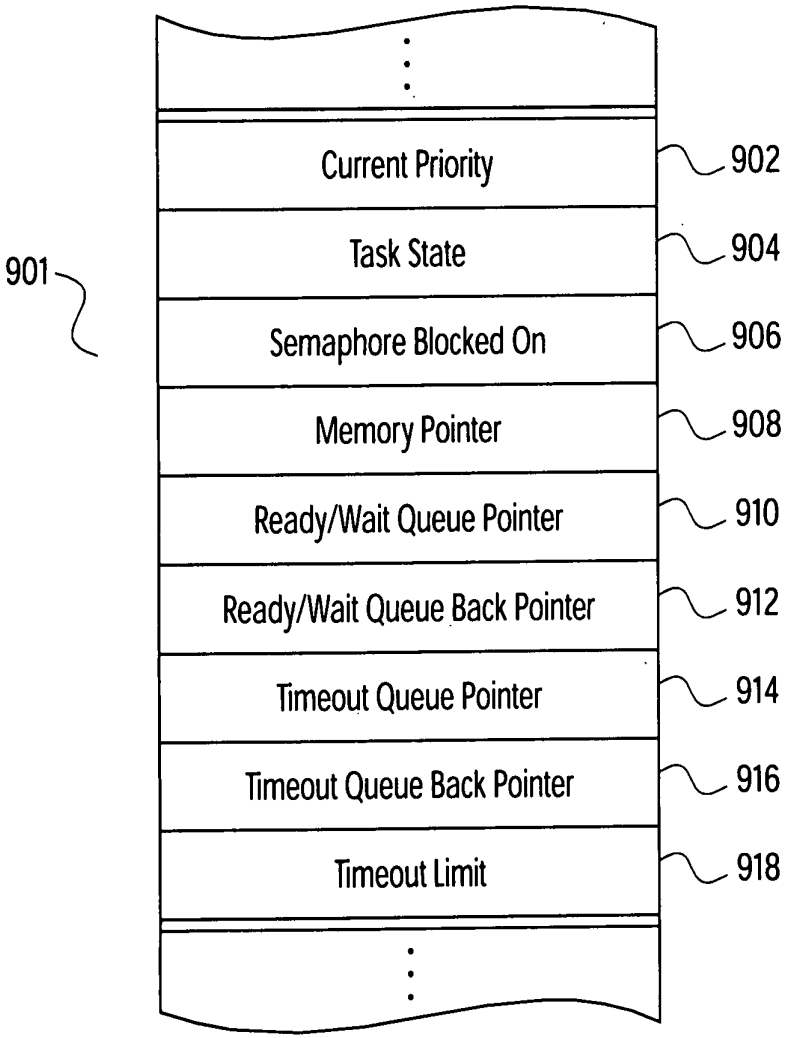
901
Current Priority
902
Task State
904
Semaphore Blocked On
906
Memory Pointer
908
Ready/Wait Queue Pointer
910
Ready/Wait Queue Back Pointer
912
Timeout Queue Pointer
914
Timeout Queue Back Pointer
916
Timeout Limit
918

FIG. 9

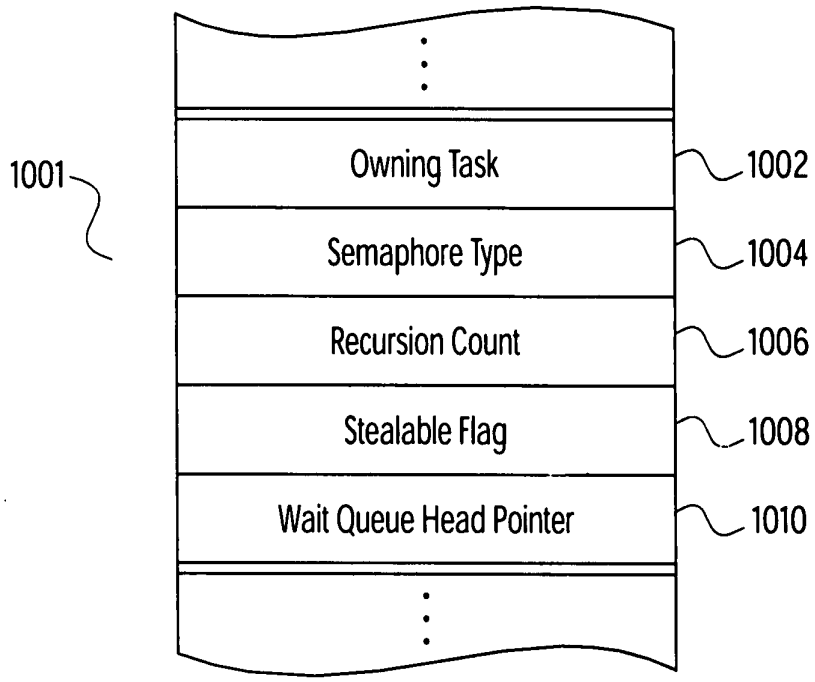
1001
Owning Task
1002
Semaphore Type
1004
Recursion Count
1006
Stealable Flag
1008
Wait Queue Head Pointer
1010

FIG. 10

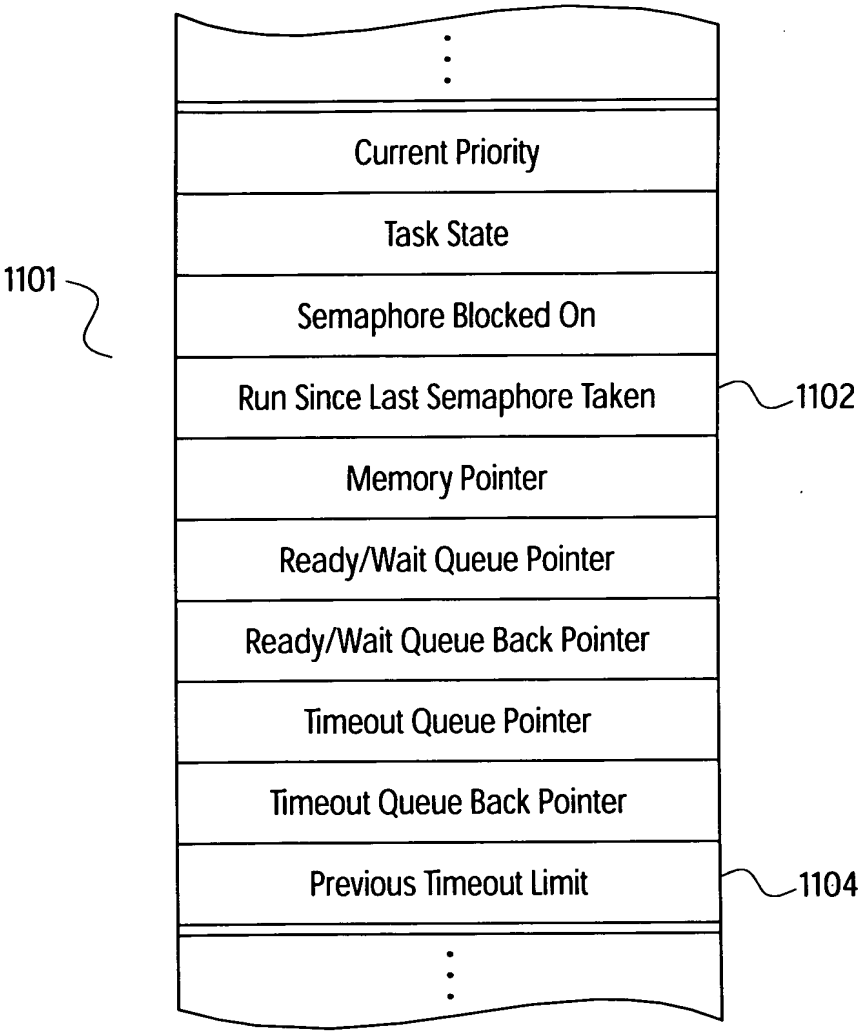
Current Priority
Task State
Semaphore Blocked On
Run Since Last Semaphore Taken
Memory Pointer
Ready/Wait Queue Pointer
Ready/Wait Queue Back Pointer
Timeout Queue Pointer
Timeout Queue Back Pointer
Previous Timeout Limit
1101
1102
1104

FIG. 11